

CLINICAL AND ECHOCARDIOGRAPHIC PROFILE OF HEART FAILURE - A CROSS SECTIONAL STUDY

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ABSTRACT:

BACKGROUND: Heart Failure is the leading cause of death globally. It is responsible for 16% of the world's total deaths. Since 2000, the largest increase in deaths has been for this disease, rising by more than 2 million to 8.9 million deaths in 2019. Clinically, Heart failure may present with varying symptoms and signs. To confirm the diagnosis of heart failure, 2D Echo is a simple non invasive imaging study which will confirm structural and functional abnormalities of the heart, hence the investigation of choice for diagnostic and prognostic value. **OBJECTIVES:** Study of clinical profile in association with 2D echo in diagnosed patients of Heart failure. **METHODS:** We had conducted a cross-sectional, observational, hospital-based study in 100 patients aged >18 years, of both genders, diagnosed with HF and willing to participate in the present study. Detailed demographic and clinical parameters with cardiac evaluation including 2D echo were done. **RESULTS:** In our study, frequency of HF was higher among the patients aged between 41 to 60 years with male predominance. M:F was 1.7 :1. Fatigue was the most frequent symptom reported in 73% cases. 51% cases had left heart failure, 35% had right heart failure, and remaining patients had biventricular failure. Hypertension and diabetes were the commonest associated comorbid conditions. With respect to 2D echo, IHD was the commonest aetiology (35%), followed by dilated cardiomyopathy (32%). Majority of patients with EF< 40% belongs to NYHA class 3 & 4. **CONCLUSION:** Frequency of HF was higher among the patients aged between 41 to 60 years with male predominance. Fatigue is the most common clinical symptom, followed by chest pain and dyspnoea. Left heart failure was more common followed by right heart failure and biventricular failure. Hypertension and diabetes were the commonest associated comorbid conditions. IHD and dilated cardiomyopathy were the most frequent causes of heart failure with respect to 2D echo. Majority of patients with EF<40% belongs to NYHA class 3 & 4. We found that as the severity of heart failure increases there are proportionate changes in the 2D Echo.

KEYWORDS: Heart failure, NYHA, EF

INTRODUCTION:

Heart failure (HF) is a clinical syndrome characterized by the inability of systemic perfusion to meet the body's metabolic demands and is usually caused by cardiac pump dysfunction.¹ Heart Failure is the leading cause of death globally. It is responsible for 16% of the world's total deaths.² Since 2000, the largest increase in deaths has been for this disease, rising by more than 2 million to 8.9 million deaths in 2019.² The recent statistical update from AHA- 2022 reported that the lifetime risk of HF remains high, with wide variation across racial as well as ethnic groups, ranging from 20% to 45% after the age of 45 years. The worldwide prevalence and incidence rates of heart failure (HF) are approaching epidemic proportions, as evidenced by the relentless increase in number of HF hospitalizations,

the growing number of HF-attributable deaths, and the spiralling costs associated with the care of HF patients.^{2,3} Owing the success in communicable diseases, the population of India is ageing, and with ageing population the burden of heart failure also rises.⁴ Risk factors like obesity, hypertension, diabetes and coronary artery disease are also on a rise, owing to rapid urbanization and influence of western culture. HF is further subdivided into systolic and diastolic HF. Systolic failure present with reduced cardiac contractility whereas diastolic failure exhibits impaired cardiac relaxation with abnormal ventricular filling. HF can result from several structural or functional congenital and acquired cardiac disorders that impair the ability of the ventricle to fill with or eject blood.^{5,6} Clinically, HF may present with a syndrome of

decreased exercise tolerance due to dyspnoea and/or fatigue-related to impaired cardiac output or may present with a syndrome of fluid retention from elevated filling pressure.⁷ A ‘two-dimensional (2D) echocardiogram with doppler’ is recommended for initial evaluation of patients presenting with HF.⁸ It uses ultrasound in the 2-7 MHz range to assess structure and function of the heart. TTE is useful to assess ventricular function, size, wall thickness, wall motion and valvular lesions. It also determines the ejection fraction of the heart, assess the mitral valve and the pulmonary venous inflow pattern, mitral annular velocity to precisely evaluate LV filling and the left atrial pressure of the dysfunctional heart.⁹

METHODOLOGY

We conducted a cross-sectional, observational, hospital-based study attending outpatient department and admitted in medical wards in the department of General Medicine, Rajarajeswari Medical College and Hospital, Bengaluru. We studied 100 patients of both genders aged between 18 to 80 years, with their informed consent, presenting with symptoms suggestive of heart failure. Critically ill patients, pregnant females were excluded from the study. After institutional ethical committee clearance, study was initiated. After taking written and informed consent, all patients were subjected to detailed medical history and complete general and systemic examination to establish the diagnosis of heart failure and rule out differentials such as renal failure, acute respiratory distress syndrome, acute or chronic liver disease.

Patients further underwent investigations including electrocardiogram (ECG), Chest x-ray and 2D echocardiography. Descriptive and inferential statistical analysis was carried out using SPSS 22.0 and R environment ver.3.2.2.

RESULTS:

The obtained parameters were analysed. The study population of 100 patients included 63 males and 37 females. 44 out of 63 males belong to the age group of 41-60 years. 23 females belong to the age group of 41-60 years. Mean age is 48.54±8.6 years with a M:F ratio of 1.7: 1 (Table 1). Majority of the patients presented with fatigue (73%) and chest pain (72%). Dyspnoea (56%), giddiness (45%) and pedal oedema (38%) were the other common symptoms (Table 2, Graph 1). Clinically, 51 patients presented with symptoms of LVF, 35 patients had RVF and 14 had biventricular failure (Table 3). 56 patients belong to NYHA class 3 and 4 (Table 4). Out of 100 patients, 49 were hypertensives. 39 patients were diabetic, of which 19 had hypertension too. 35 patients had a history of CAD, with 11 being hypertensive and 9 diabetic. 9 patients were suffering from COPD, of which 8 of them were hypertensive (Table 5). With respect to 2D Echo, IHD was the commonest aetiology (35%), followed by dilated cardiomyopathy (32%). The frequency of HHD and VHD were 22% and 11% respectively (Table 6, Graph 2). 27 patients with NYHA 3 and 18 patients with NYHA 4 had EF in the range of < 40%. Only 11 patients belonging to NYHA 3 & 4 had an EF>50% (Table 7, Graph 3).

Table 1: Distribution of subjects according to their age group and gender

Age	Number of study population N (%)	Male	Female
21 to 30	2	2	-
31 to 40	23	11	12
41 to 50	32	23	9
51 to 60	35	21	14
61 to 70	8	6	2
Mean	100	63	37

Table 2: Distribution of the recruited study population based on clinical symptoms

Symptom	N (%)
Fatigue	73
Chest pain	72
Dyspnoea	56
Giddiness	45
Pedal oedema	38
Syncope	12

Graph 1: Distribution of the recruited study population based on clinical symptoms

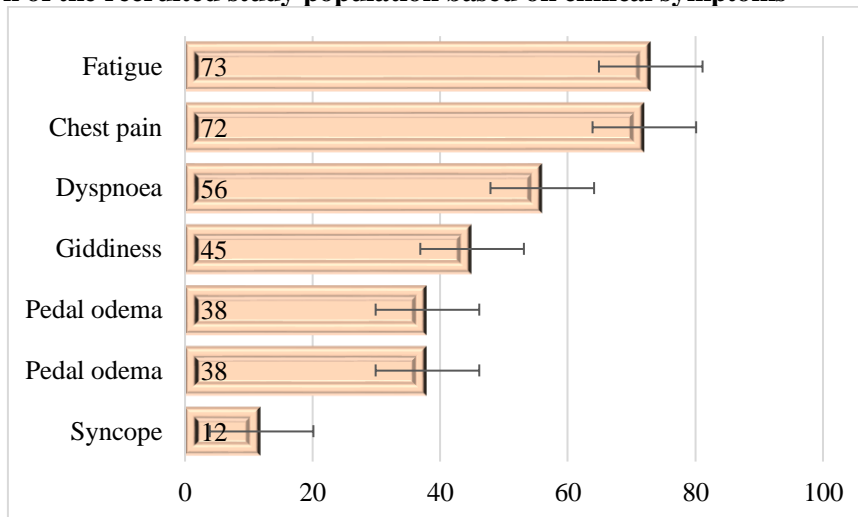


Table 3: Distribution of subjects according to their type of heart failure

Type	N (%)
Left heart failure	51
Right heart failure	35
Biventricular	14

Table 4: Distribution of recruited study population according to their NYHA class

NYHA	N (%)
1	13
2	31
3	34
4	22

Table 5: Distribution of patients based on comorbid conditions/aetiologies

COMORBID CONDITIONS	N (%)
Hypertension (HTN)	49
Diabetes mellitus (DM)	39
Coronary artery disease (CAD)	35
HTN+DM	19
CAD+HTN	11
CAD+DM	9
Chronic obstructive pulmonary disease (COPD)	9
HTN + COPD	8
Hypothyroidism	2
Congenital heart disease	1
Rheumatic heart disease	1

Table 6: Distribution of subjects according to 2D echo etiological diagnosis

Diagnosis	N (%)
IHD	35
Dilated Cardiomyopathy	32
HHD	22
VHD	11

Graph 2: Distribution of subjects according to 2D echo etiological diagnosis

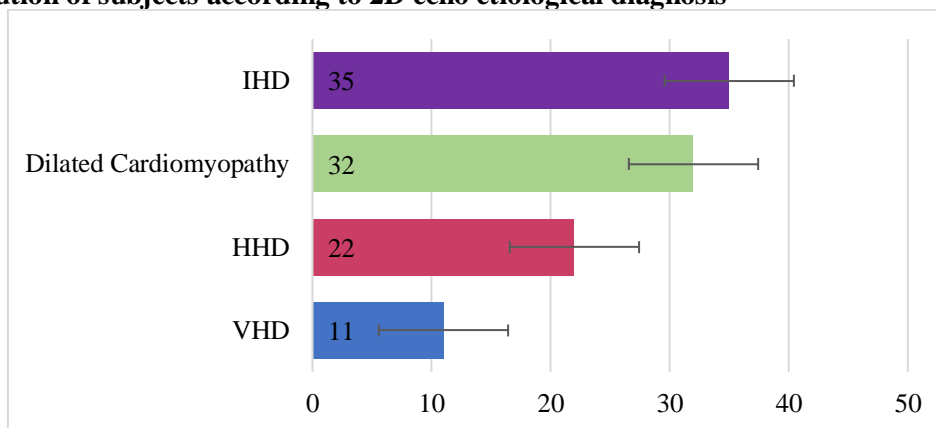
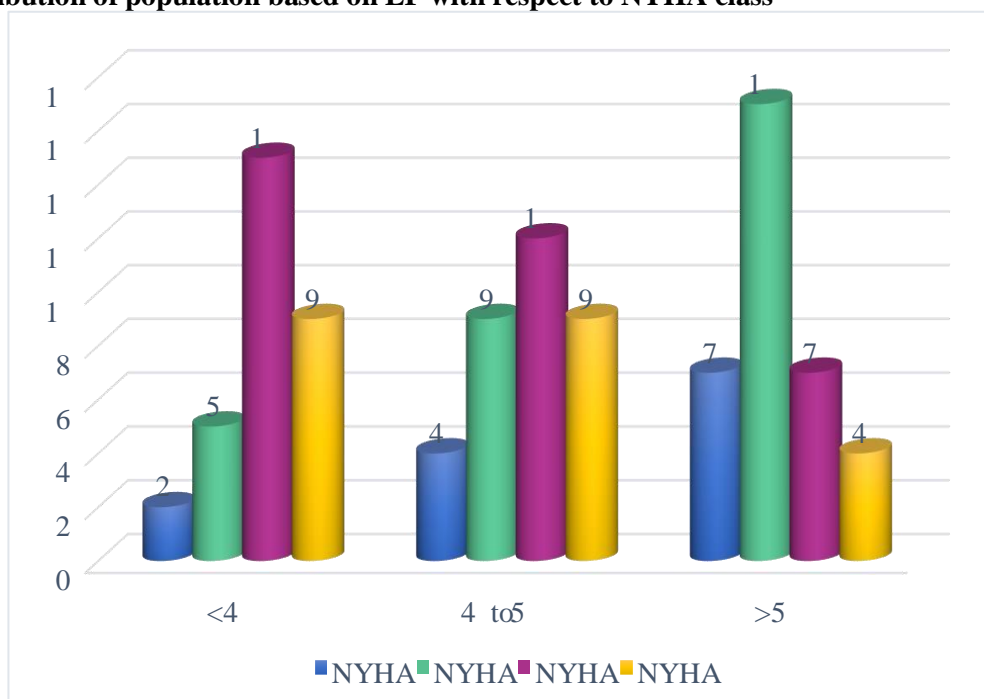


Table 7: Distribution of recruited study population according to their ejection fraction with respect to NYHA class

EF	NYHA 1	NYHA 2	NYHA 3	NYHA 4	P value
<40	2 (15.38%)	5 (16.12%)	15 (44.11%)	9 (40.9%)	NS
40 to 50	4 (30.76%)	9 (29.03%)	12 (35.3%)	9 (40.9%)	
>50	7 (53.84%)	17 (54.83%)	7 (20.58%)	4 (18.18%)	
	13	31	34	22	

Graph 3: Distribution of population based on EF with respect to NYHA class



DISCUSSION:

DISCUSSION ON DEMOGRAPHIC DETAILS:

We studied 100 patients diagnosed with HF. We observed that frequency of HF is comparatively higher among the patients aged >51 years, which is complemented by the epidemiological study by Mosterd A et al.¹⁰ Similar observations were reported by Ohlmeier C et al and Savarese G et al.^{11,12} This could be attributed to age related vascular and lipid

changes observed among elderly population, leading to resistance in blood flow. Also, CHARM study has reported that the median age of the patients with HF was 67 years, ranging between 51 to 74 years.¹³ We observed 63 males and 37 females in our study. Similar findings were observed in other clinical epidemiological studies^{11,12,13} of HF too, suggesting that the frequency of HF is associated with age but not gender. (Table 1)

DISCUSSION ON SYMPTOMATOLOGY AND COMORBIDITIES:

Majority of the study population presented with fatigue as their chief complaint accounting for about 73%, followed by 72% with chest pain. Dyspnoea, giddiness and pedal oedema were the other common symptoms found among 56%, 45% and 38% respectively. (Table 2, Graph 1) 51% of the study population had symptoms of LVF, followed by 35% with RVF and the 14% with biventricular failure. (Table 3) Reddy S et al mentioned that the classical clinical symptoms of heart failure were exertional dyspnoea, orthopnoea, paroxysmal nocturnal dyspnoea and fatigue, and the signs included elevated jugular venous pressure, pulmonary rales, third heart sound and peripheral oedema. No single symptom or sign is pathognomonic of heart failure.¹⁴ They also highlighted that symptoms vary based on systolic and diastolic dysfunction, as well as the right or left ventricular dysfunction. No epidemiological studies have given the incidence or the prevalence of RVF, LVF and biventricular failure. Majority of the study population had associated comorbid conditions, 49 being hypertensive, 39 with diabetes, out of which, 9 patients had both hypertension and diabetes. 35 patients had a history of coronary artery disease, 9 with COPD, 1 each were RHD and CHD. We did not find any significant difference in the distribution of comorbid conditions between the two groups. (Table 5)

2D ECHO FINDINGS:

On analysing the 2D echo findings, we observed that the frequency of IHD was more, accounting for 35% of the overall population, followed by 32% with dilated cardiomyopathy. The frequency of HHD and VHD was 22% and 11% respectively. (Table 6)

Hu Y et al¹⁵ aimed at assessing the correlation between ECG, 2D echo and the severity of HF based on NYHA including various comorbidities, and found that as the severity increases, there will be more changes with ECG as well as 2D Echo. Also, there was observed reduction in ejection fraction as the severity increased.

DISCUSSION ON NYHA DISTRIBUTION AND HF:

Among 100 patients in our study, 34 belonged to grade 3 of NYHA and 31 were grade 2 NYHA. 22% and 13% of the population belong to grade 4 and grade 1 respectively. (Table 4). The EF in patients with NYHA grade 4 was significantly less compared to the other groups. We also observed that there was an inverse association of EF with NYHA. As the severity increased, the EF was reduced drastically. Patients with EF >40 was less frequent in NYHA 3 and 4 (Table 7). A clinical study by Spolador R et al¹⁶ aimed at assessing the correlation between basic demographic details, NYHA classification and echocardiography,

mainly the ejection fraction. Their study concentrated on LV dysfunction. They found that in class IIA patients, mean age was 64 ± 9 years with EF $43 \pm 10\%$, which was significantly less compared to class I. In class IIB patients, mean age was 67 ± 10 years with EF $39 \pm 12\%$. In class III patients, mean age was 65 ± 11 years with EF $32.77 \pm 12.91\%$. We can observe the same association between NYHA and EF in our study. Oh Jk et al.¹⁷, has mentioned that about 50% of patients with new onset of heart failure have normal EF.

CONCLUSION:

In our study, frequency of HF was higher among the patients aged between 41 to 60 years with male predominance. M: F was 1.7 :1. 73% patients presented with fatigue, followed by 72% with chest pain. 51% cases had left heart failure, 35% had right heart failure, and remaining patients had biventricular failure. Hypertension and diabetes were the commonest comorbid conditions in our study population. With respect to 2D echo, IHD was the commonest aetiology (35%), followed by dilated cardiomyopathy (32%). Majority of patients with EF < 40% belongs to NYHA class 3 & 4. 2D Echo is a simple, non-invasive imaging study which has got diagnostic and prognostic value in patients with heart failure. By conducting routine follow up with 2D Echo in heart failure patients receiving treatment, prognosis can be assessed.

LIMITATIONS OF THE STUDY:

1. All patients diagnosed with IHD on basis of 2D Echo have not undergone coronary angiogram
2. Follow up of heart failure patients with 2D Echo was not done in our study, so we could not assess prognosis of studied subjects.

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